

Global consequences of sustainable development of agriculture

Globální souvislosti udržitelného rozvoje zemědělství

M. SVATOŠ

Czech University of Agriculture, Prague, Czech Republic

Abstract: The principal importance and global dimension of sustainable agriculture in frame of a strategy of civilization development is beyond discussion. The actual character of the topic of looking for ways to sustainable development is confirmed by the extensive worldwide program "Millennium Ecosystem Assessment" the purpose of which is to map and subsequently monitor the health of the planet Earth. The contribution is focused on various aspects of the non-substitutable role of agriculture regarding sustainable development on the level of developing and developed countries and on the regional and global level.

Key words: sustainable development, sustainable agriculture, global ecosystem, multifunctional agriculture, nutrition, quality of life

Abstrakt: Zásadní důležitost a globální rozměr udržitelného rozvoje zemědělství v rámci strategie civilizačního rozvoje je mimo diskusi. Aktuálnost tématu hledání cest k udržitelnému rozvoji potvrzuje rozsáhlý celosvětový program „Ekosystémové hodnocení milénia“ (Millennium Ecosystem Assessment), jehož záměrem je zmapovat a následně monitorovat zdraví planety Země. Příspěvek je zaměřen na různé aspekty nezastupitelné role zemědělství vzhledem k udržitelnému rozvoji na úrovni rozvojových a vyspělých zemí a na úrovni regionální a globální.

Klíčová slova: udržitelný rozvoj, udržitelné zemědělství, globální ekosystémy, multifunkční zemědělství, výživa, kvalita života

INTRODUCTION

The possible solutions of the problems of sustainable development, which are of a global character, significantly differ from the viewpoint of the state and the concrete possibilities in particular parts of the world. This fundamental topic for the world future cannot be separated from the multilateral and mutually connected globalization processes and trends. Although the economic dimension of globalization represents at present a decisive direction of human society development, neither can social and environmental criteria be left out, especially regarding the perspective of sustainable development of human society. The role of agriculture in this context (globalization of sustainable development) is especially fundamental for more than 80% of the world population living in developing countries and very significant for inhabitants of developed countries as evidenced by the extent of agrarian-political measures and their financial cost demands. It is necessary to appreciate the fact that all world inhabitants are completely and in the non-substitutable way depend-

ent on it as food consumers and about 42–45% of the current world population is dependent on agriculture by their living, though the share of agriculture in GDP on the world level is in average only 4%.

GOALS, MATERIALS AND METHODOLOGY

The aim of the contribution is to determine the basic correlations and trends characterizing the development tendencies of (sustainable) agriculture and nutrition in the global context, the ecosystem prerequisites of sustainable development and forming of multifunctional agriculture including the relevant implications.

A methodical procedure is based on the externalization of the selected important connections determining development trends of sustainable development, sustainable agriculture and sustainable life in the national, regional and global frame including the time aspect.

The results of solution of the IRI FEM CUA in Prague MSM 411100013 "Efficient integration of Czech agrar-

ian sector into the frame of the European structure – the prerequisite of sustainable development” were used here.

Ecosystem prerequisites of sustainable development

Welfare and the progress towards sustainable development are in basic way dependent on the improvement of the world ecosystems care. However, the present trends do not correspond to that. While the requirements for ecosystem services (e.g. food, drinking water) increase, the human activity leads to the degradation of many ecosystems.

The mankind was always dependent on the services of biosphere and its ecosystems. Although the mankind put culture and technology between itself and the environment, which will enable to “control” or “change” the nature, though it is still at the very end absolutely dependent on the continual supply of ecosystem services.

A growing negative incidence of the degraded ecosystems represents a basic limitation for welfare and economical growth. The corresponding interventions in political and management sphere can often avert degradation of ecosystems and vice versa to increase their share in welfare (the quality of human life).

The search for ways to sustainable development is also the focus of e.g. the extensive worldwide program Millennium Ecosystem Assessment (MA) which was initiated in the frame of the UNO in the year 2001 with the aim to map the Earth health. The importance of the project results from the fact that all main world ecosystems have never been evaluated in complex yet. The purpose is to obtain a comprehensive synthesis of scientific pieces of knowledge about impacts of world ecosystems changes on basic conditions of life of inhabitants from a viewpoint of maintenance and development of potential estates and services, sources of which ecosystems are. Among the contributions of the MA projects, there belong undoubtedly consistent aggregations of the natural and social scientific areas, as well as the integration of economical, environmental, social and cultural aims.

The search for measure at the local, national and global level in favour of ecosystems for the sake of the contribution to the quality of life and reducing poverty is the result of the conceptual and methodological approach of the MA. Its core lays also in providing a sufficient groundwork for governments, private sector and civil communities so that better information about ecosystems and ecosystem services can be used in decision making about a development strategy or own activity.

The protection, reproduction and development of ecosystem services tend to bring multiple and synergistic effects as well as the benefit from a better education or government.

RESULTS AND DISCUSSION

The conception frame of ecosystem evaluation of millennium

The MA paid attention above all to the mutual relations between ecosystem services and the quality of human life (welfare). An ecosystem is a dynamic complex of the community of plants, animals, micro-organisms and abiotic environment which work upon themselves mutually and create a functional unit. People are an integral part of these ecosystems. The ecosystem provides to the mankind benefits of various kinds, e.g. services of supply, regulation, cultural, subsidiary and the like. An ecosystem concept creates an efficient frame for the analysis of mutual relations between people and the environment. The MA conception frame is a consistent ecosystem approach included in the “Convention about biological diversity” (CBD). According to the CBD, the ecosystem approach represents a strategy determined for integrated managing land, water and live resources which secure in a subsidiary way their protection and sustainable use. This approach stems from the fact that people with their cultural diversity are an integral part of many ecosystems.

Among the wider characteristics of ecosystem evaluation of the millennium (MA), there belong:

- relatively short time frame (2001–2006) and subsequent repetition
- cooperation of governments, a private sector, non-governmental organizations and scientist from more than 100 countries (a mobilization aspect)
- support in achieving the Development Aims of the UNO millennium
- help in working the Plan of World Summit Implementation 2002 on sustainable development
- identification of areas of wide scientific agreement and delimitation of areas where scientific discussion proceeds
- supply of mechanisms developed in frame of MA for the political sphere:
 - determination of existing possibilities for achieving mankind development and aims of sustainability (dynamic balance among an economic growth, social development and needs of environment protection)
 - understanding of reasons for compromises in decision making about the environment of life

- among particular sectors or participants of decision sphere and so on (the use of multi-sector approach and use of information about the complex impact of the choice of possible conceptions)
- localisation of the possible solution at such levels of executive power where the biggest effect will be reached (different interests and possibilities of interference at the local, national and global level)
- contribution to understanding of relations and linkages between ecosystems and welfare and a demonstration of ecosystems ability to contribute to decrease of poverty and to enrich the quality of human life
- integration of economic, environmental, social and cultural efforts
- integration of information of natural science and humanities branches
- investigation and application of possible measures for sustainable management of ecosystem services in connection with their harmonization with fulfilment of human needs
- making easier the integrated care of ecosystem

Scheme of the conception frame at local, regional and global level

A. Quality of life – welfare and decrease of poverty are determined especially by these elements:

- material minimum for a contented life (an approach to resources, earnings)
- safety is given by changes in providing ecosystem services (ensuring food, decrease of resources and so on)
- health
 - health care
 - suitable nutrition
 - sufficiency of clean water
 - clean air
 - an energy for heating (air-conditioning)
- good social relations – possibilities of being of use and expressing of aesthetic, recreational, cultural and spiritual values connected with ecosystems
- freedom and possibility of choice

B. Services of ecosystems

Benefits for people:

- providing estates, i.e. food, water, power resource, bio-chemicals, genetic resources
- regulation services – a climate, diseases, quality of air, water resources and so on
- cultural services – spiritual and religious, recreational, aesthetic, educational, sensational, cultural heritage

- subsidiary services – a primary production, soil creation, food chains and so on. (necessary for maintaining of other services)

C. Direct driving forces of change

(physical, chemical, biological)

- local change of soil cover and use of land
- introduction and disappearance of biological species
- adaptation and use of technologies
- air and water pollution
- pumping and need of resources
- climatic changes
- external inputs (fertilizers, pesticides, irrigations)
- non-controllable natural, physical and biological powers (evolution and others)

D. Indirect driving forces of change

- demographic (size of population, age, sexual and territorial structure, growth rate and so on)
- economic (GDP per inhabitant, growth rate, macroeconomic policy, foreign trade, capital flows and so on)
- social political (democratization, role of women, of civil societies, of the private sector, of social net and so on)
- scientific and technological (investment in research, structural changes in favour of developed technologies – bio, info)
- cultural and religious (consumption patterns, value spectrum)

Among basic possibilities of improving of decision-making process about ecosystem services, there belong:

- use of the best disposable information
- decision-making process should be transparent, using local knowledge and all interest groups should participate in it
- sufficient attention to equality of rights for the most vulnerable groups of inhabitants
- use of the analytical frame taking account of strong and weak points
- evaluation of the consequences of decision irreversibility
- the connection of reliability and decision competency
- use of the principle of efficiency in decision making
- taking into account marginal situations, cumulative multilevel and marginal impacts, local, regional and global costs, profits and risks.

A certain way in this direction is represented by the adaptive management, the process of social determination, security of minimal standards and the principle of preliminary caution.

Forming of multifunctional agriculture

In the frame of the discussion about agricultural policy, changes in foreign-trade area in the WTO negotiations and in the context of political decision-making at the national, integration or global levels, an important role is played by the term multifunctional agriculture. Up to now, the opinions of the conception of multi-functionality of agriculture have not been consolidated yet either in the frame of the OECD countries, let alone in the worldwide measure.

Gradually, there is formed such a conception of multifunctional agriculture which represents the substance of the European model of agriculture which becomes determinant not only for agrarian-political measures of member states but also for multilateral negotiations in the global measure (the WTO, food and development aid and so on.)

The scheme 1 represents a conception of multifunctionality of agriculture stemming from the EU environment.

Market connections of multifunctional agriculture

Agriculture belongs among the areas where market does not lead to optimal solutions and so-called market failure happens. It relates to problems of externalities, public estates or non-equal distribution of incomes and property. An externality represents an unwanted (indirect) effect from the viewpoint of market functioning. It can mean a negative externality (a subject non-participating in market transaction is damaged by cost increase and so on) or a positive externality (a non-participating subject gets an effect without own deserving). Therefore, it is obvious that market which cannot evaluate the positive and negative consequences of one group of economic subjects on other economic subjects can neither regulate these consequences (externalities). The connection of the market and externalities is connected with the fact that the determination of property rights is in some cases very difficult or impossible. Moreover, the market has an internal tendency to stimulate such a production or achievements, which are connected with the creation of negative externalities (they do not increase costs of producers).

Other type of market failure is the preference of private goods production compared to public goods. It is given by the fact that in case of public goods, it is not possible to separate paying and non-paying consumers because of their indivisibility. The market tends to eliminate all non-paying consumers from the use of benefit. Then, the consequence is a tendency of market mechanism to divide economic resources non-equally between public and private goods.

From the multifunctional agriculture viewpoint, "production" of positive externalities is estimated (negative externalities are unwanted outputs). Borders for the determination of a positive (negative) externality are given by many particular standards (environment, food safety, animal welfare and so on) or also in the form of the principles of good agricultural practice. Among the most important positive externalities of (multifunctional) agriculture, there belong landscape maintenance, maintenance of the traditional character of landscape, decrease of environmental stress of land and water, contribution to biodiversity, to employment and development of human and social capital of the countryside and so on.

Realization of public goods runs in a quasi-market of public goods where the side of demand is usually represented by public resources (budgets of states, regions or municipalities, or resources of non-governmental organization and so on). In some cases, a part of public goods can be covered also from private sources (tourism entrepreneurs participate in costs for the maintenance of landscape in significant tourist localities). Beside private and public goods, there is also the category of so-called club goods, which are sold only to club members.

A balanced ratio of the production of commodity and non-commodity outputs in one side and a private and public goods on the second side is a basis of the European model of agriculture which the EU strives to enforce into the WTO negotiations. The basic aim is the decrease of production (overproduction) of agricultural commodities of the environmentally unfavourable and less efficient kind with the in a present increase of other outputs of multifunctional agriculture.

It is obvious that the development of multifunctional agriculture is subject to many measures, among which a significant role is played by measures to support production of public goods which represents the society demand for these goods. Functioning of this quasi-market of public goods, i.e. the balance of demand and supply is given partly by the willingness of taxpayers to pay for public goods and partly by the willingness of farmers to produce public goods. Saving money of taxpayers can be realized by legal measures – enforcement of the production of public goods,

Scheme 1. The conception of multi-functionality of agriculture

	Production (achievement)	Food and raw materials for food production, for industrial processing, for energy production (commercial activities, remunerated by means of markets)
Achievements of agriculture for the society	commercial	<ul style="list-style-type: none"> – direct sale – agri-tourism – services aimed to use of leisure time – lease of land and buildings – communal work – landscape care – utilization of communal waste (remuneration by means of markets)
	non-commercial	<ul style="list-style-type: none"> – active landscape creation by extensification – elimination of agric.land from farming – adjustment of virgates and cropping patterns – establishment of care of biotopes – protection of landmarks – maintenance of biodiversity of flora, fauna incl. local cultural varieties and breeds <p>(They cause financial losses; non-existing markets are subsidized by a demand for these services from public means – adjustment payments, agreements and so on)</p>
	Secondary achievements	<ul style="list-style-type: none"> – a passive landscape care – a maintenance of natural potentials (soil fertility, level of underground water, linkage of CO₂ and so on) in connection with principles of a right agricultural practice – contributions to a regional economic growth – effects in favour of maintenance of landscape culture – effects for strengthening the level of social life in the countryside <p>(This represents an accompaniment of individual economic interests and for that reason they can be remunerated separately with difficulties – a problem of remuneration, a significant argument for maintenance and support of agriculture in a region)</p>
	Negative secondary impact	<ul style="list-style-type: none"> – abiotic resources endangering by pollutions (soil, water, air) – biotic resources endangering (biodiversity) – degradation of soil by erosion, stiffening (unsuitable technique) – breeding procedures nonconforming use of animals – insufficient quality of products and food safety

applying of the principle “polluter pays”, ecological taxes on inputs and so on.

The decrease of risks of the public goods quasi-market failure is unambiguously connected with the fulfilment of the state role regarding the market. There is a basic agreement in the fact that three basic function of the state (government) in relation to the market consist in security of conditions for good functioning of the market mechanism (compensation of positive externalities, removal of negative externalities, security of the sufficiency of public estates, minimisation of the monopoly influence), in admission of the rules for just functioning of the market mechanism (redistribution

of incomes) and security of the internal and external stability of economy (stabilization economic policy).

Global public goods

International visions of the public goods domain (10 kinds of global public goods):

- basic human dignity for all people, including general approach to basic education and health care
- complying with national sovereignty
- global public health, mainly the control of contagious diseases

- global safety or – in other way – global public domain devoid of criminality and violence
- global peace
- a system of communication and transport harmonized among states (borders)
- internationally harmonized institutional infrastructure for support of market sufficiency, general human rights, a transparent and responsible government and harmonization of technical standard
- harmonious management of knowledge, including worldwide complying with rights of intellectual ownership
- harmonious management of global natural municipal property for enforcement of its sustainable use
- availability of international arenas for multilateral negotiations among states mutually, states and non-state participants

Possible tools and mechanisms for financing global public goods:

- creation of international component of allotment branch of public finances
- renewal of official development aid spend on global public goods to provide aid
- including of costs of international cooperation for global public goods in the budget of net agencies and ministries
- creation of national grant funds for an international cooperation
- foundation of international accounts or trust funds for global questions
- determination of priority investment opportunities
- foundation of a widely representative institution for security of cooperation in area of global public goods.

Nutrition and demographic situation in the world

The UNO World Conference on Nutrition (Rome 2002, delegates from 181 states, representatives of approx. 1 000 organizations) states a small progress in solution of the nutrition situation (hunger) in the world.

Scheme 2. Critical situation of the world in nutrition and standard of living

Number of inhabitants	Indicator
6.3 bill.	world in total in 2003
0.8 bill.	chronic hunger
1.0 bill.	homeless
2.7 bill.	no sanitary equipment
1.3 bill.	no clean water
0.8 bill.	no medical care
0.85 bill.	illiteracy
2.0 bill.	without electricity
1.3 bill.	less than 1\$ of daily income

Source: UNO 2003

The rate of hunger and poverty in some regions of the world has many negative economic and social consequences which represent a danger for peace, stability and safety in national, regional and global context.

Based on the data of the German Foundation for the World Population (DSW), a fast increase of the world population by c. 1 bill. during the last 10 years is caused from 99% by the growth of population in the developing world. Continuing of these trends in the present territorial structure would have as a consequence during one generation (20 years) a multiple increase of the share of inhabitants in countries with a complete insufficiency of water (2.9 bill.), of arable land (0.64 bill.) and of water (2.2 bill.).

The position of developing countries for which agriculture represents a decisive economic activity requires a fundamental measure to improve the internal frame conditions by increase of means for the development cooperation (fulfilment of the engagement of developed countries to provide 0.7% of GDP for development aid) and a significant restriction of agrarian supports and protectionism from the side of the OECD countries which were characterized as an obstruction of progress of smallholder agriculture in the countries with insufficient nourishment. Developing countries demand an international adjustment or rules for reducing the negative influences in these countries.

Table 1. Agrarian support of selected countries in 2002 according to the OECD definition

Agrarian support (expression)	Unit	EU	USA	Australia	Japan
Share in the value of production	%	36	18	4	59
Per 1 worker (full time)	1 000 €	18	17	3	22
Per 1ha of agricultural land	€	775	100	2	9 580

Source: Situationsbericht 2004 (2003)

Table 2. Dynamics of the world population growth (1950–2050)

Continent	Number and structure of population						Index of growth (decrease) in %		Average yearly rate of growth in %	
	1950		2003		2050*		2003/1950	2050/2003	1950–2003	2003–2050
	mill.	%	mill.	%	mill.	%				
Europe	547	21.7	726	11.5	632	7.1	132.7	87.1	0.54	–0.29
North America	172	6.8	326	5.2	448	5.0	189.5	137.4	1.21	0.68
Australia, Oceania	13	0.5	32	0.5	46	0.5	246.2	143.8	1.71	0.78
Asia	1 398	55.5	3 823	60.7	5 222	58.6	273.5	136.6	1.92	0.67
Latin America	167	6.7	543	8.6	768	8.6	325.1	141.4	2.25	0.74
Africa	221	8.8	851	13.5	1803	20.2	385.1	211.9	2.58	1.61
World	2 519	100	6 301	100	8 919	100	250.1	141.5	1.74	0.74

*Forecast (medium variant)

Source: UN, own calculations

Nutrition safety in the conception of the Non-governmental Organizations Forum (Rome 2002) is based on the right of states to separately determine policy in the area of agriculture, nutrition and labour which will correspond ecologically, socially, economically and culturally to the conditions and the demographic situation in the particular (development) countries. In this context, there is a priority needed for food production for a domestic market, fair prices for farmers, a protection against imports for dumping prices, a support of woman role in food production and a moratorium for genetically modified food.

CONCLUSION

During one or two generations, a fundamental change will occur in the relation between the man and the nature. The fast rate of the scientific progress and civilization development leads to a gradual detaching of the mankind from its natural determination. People stop to be mere participants of the global ecosystem and have to take over the function of a caretaker, a householder or a manager of this unique global ecosystem, which is based on the development of science, technology and social structure which will enable a forecast of impacts of human activities and anticipate a course of particular natural cycles. This situation is new principally in the fact that it is not possible to avoid the responsibility for “management” of the Earth. Our decision or indecisiveness in the area of economics, agriculture, environment and social in frame of developed and developing

countries will determine the future of the planet Earth towards sustainable or non-sustainable development. A fundamental role in this decision-making in creation of the world future will be played by questions connected with sustainable development of agriculture and nutrition, and that not only in the developing world but also in developed countries.

REFERENCES

- Agra-Europe (2004). Bonn.
 Ekosystémy a kvalita lidského života: Rámec pro hodnocení MŽP (2003). Prague (translation).
 Global Public Goods Financing: New Tools for New Challenges (2002). UNDP, New York.
 Human Development Report 2004 (2004). UNDP.
 Köhne M. (2002): Multifunktionalität honorieren. Agrarische Rundschau, (4), Vienna..
 Multifunctionality (Towards an Analytical Framework) (2001). OECD Publications Service, France.
 Providing Global Public Goods (2003): Managing Globalization. UNDP, New York.
 Situationsbericht 2004 (2003). Trends und Fakten zur Landwirtschaft, Deutschen Bauernverband, Bonn.
 Tvrdoň J. et al. (2004): Efficient integration of the Czech agrarian sector in frame of European structure – presumption of sustainable development. IVZ FEM CUA Prague.

Arrived on 2nd December 2004

Contact address:

Prof. Ing. Miroslav Svatoš. CSc., Česká zemědělská univerzita v Praze, Kamýcká 129, 165 21 Praha 6-Suchdol, Česká republika
 tel. +420 224 384 288, e-mail: svatos@pef.czu.cz